

[54] COMBINATION MICROWAVE AND CONVECTION OVEN

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FOREIGN PATENT DOCUMENTS

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Related U.S. Application Data

[63] Continuation of Ser. No. 255,093, Apr. 17, 1981, abandoned.

[30] Foreign Application Priority Data

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[52] U.S. Cl. 219/10.55 B; 219/10.55 R; 219/400; 126/21 A

[58] Field of Search 219/10.55 R, 10.55 B, 219/10.55 E, 400; 126/21 A, 21 R

[56] References Cited

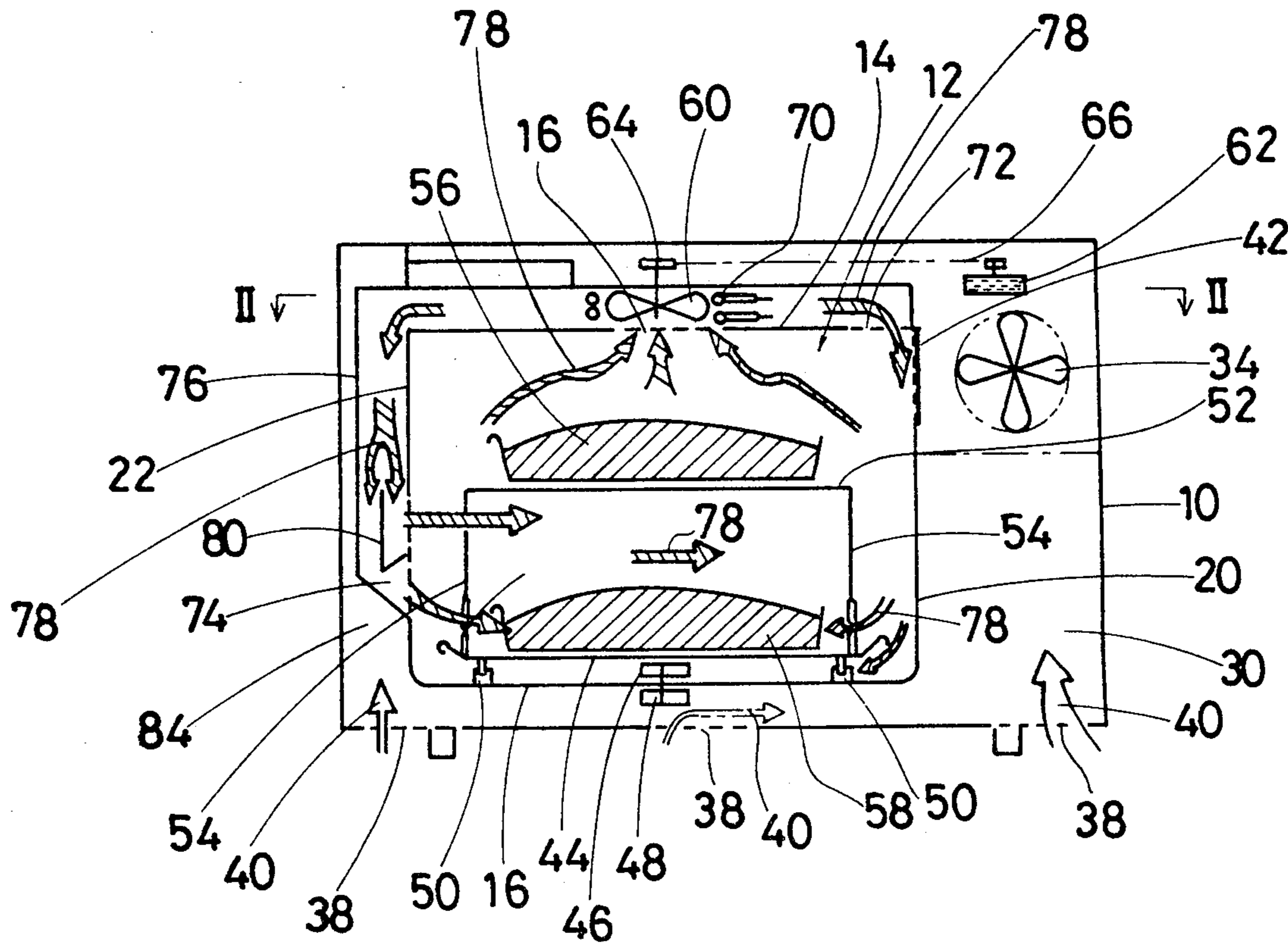
U.S. PATENT DOCUMENTS

2,898,437	8/1959	McFarland	219/400 X
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[57] ABSTRACT

A cooking apparatus for performing a microwave cooking operation and a convection cooking operation wherein heated air is circulated in an oven cavity. An air intake aperture is formed at the center of the ceiling wall of the oven cavity. The air removed through the air intake aperture is heated up by a heater and reintroduced into the oven cavity through a first blowoff aperture which is positioned at the corner of the ceiling wall near a right side wall of the oven cavity, and through a second blowoff aperture which is asymmetrically positioned at the lower portion of a left side wall of the oven cavity.

6 Claims, 2 Drawing Figures



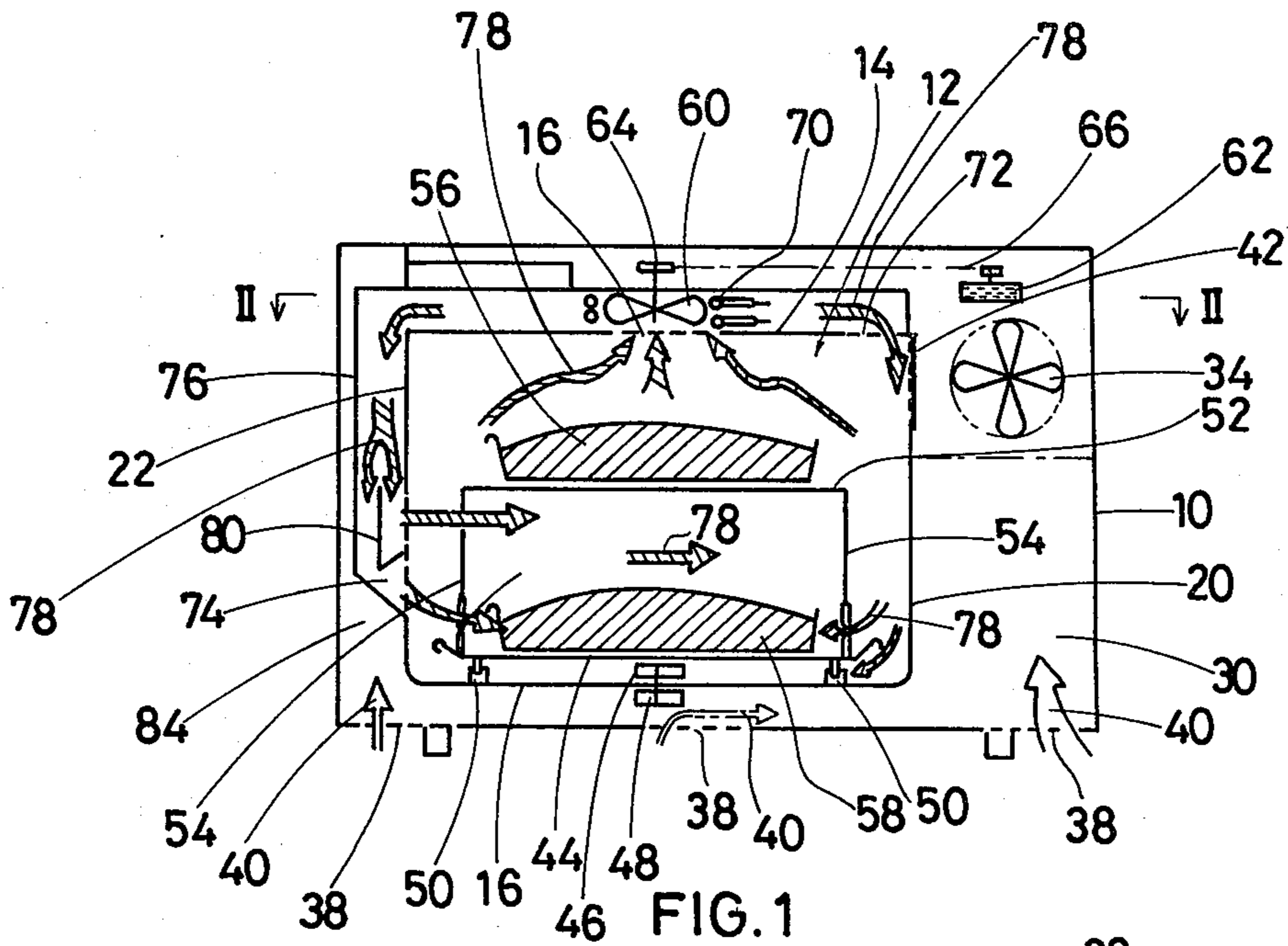


FIG. 1

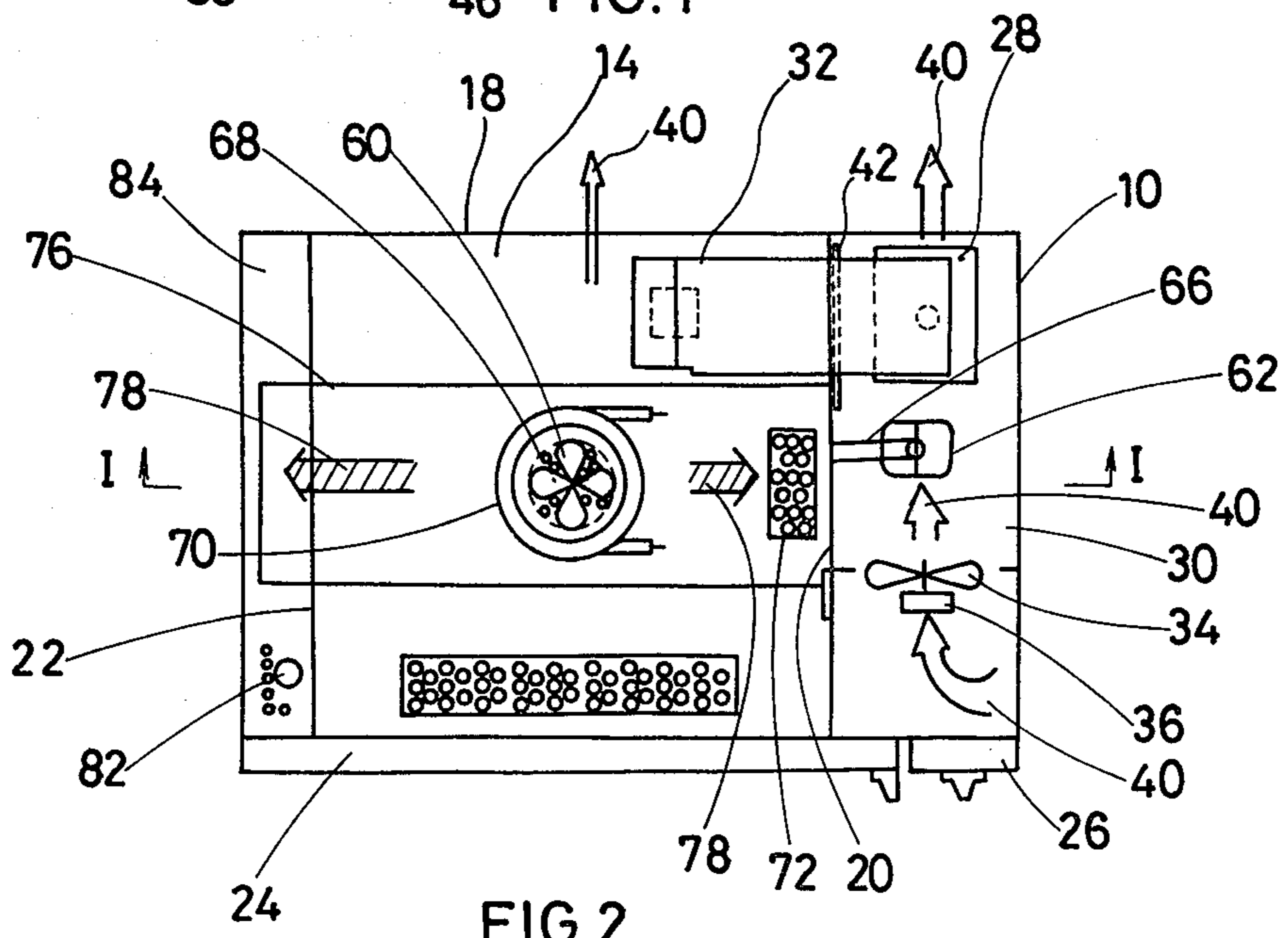


FIG. 2

COMBINATION MICROWAVE AND CONVECTION OVEN

This application is a continuation of copending appli- 5
cation Ser. No. 255,093, filed on Apr. 17, 1981 under 37
CFR 1.62, now abandoned.

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates to a cooking apparatus
of the heated air circulating type.

The conventional cooking apparatus of the heated air
circulating type includes a heated air blowoff aperture
for supplying heated air into an oven cavity and an 15
intake aperture for taking out air from the oven cavity
for recirculation purposes. Both the heated air blowoff
aperture and the intake aperture are formed in the ceiling
wall of the oven cavity and, therefore, a uniform
cooking is not ensured. Further problems occur when a 20
double stage tray is employed, because the foodstuff
mounted on the lower tray does not receive a sufficient
amount of the heated air.

An improvement is proposed in U.S. Pat. No.
2,898,437, COMBINATION ELECTRIC COOKING 25
APPLIANCE, by Donald L. McFarland, which was
issued on Aug. 4, 1959. In the appliance disclosed in
U.S. Pat. No. 2,898,437, the heated air blowoff aperture
is formed at the corner of the ceiling wall, and the in-
take aperture is formed in the lower section of the side 30
wall of the oven cavity. Even in such an appliance, a
uniform flow of the heated air in the oven cavity is not
ensured.

Accordingly, an object of the present invention is to
provide a cooking apparatus of the heated air circulat- 35
ing type, which ensures uniform cooking.

Another object of the present invention is to locate a
heated air blowoff aperture and an intake aperture at the
most preferable positions to ensure a uniform cooking in
a cooking apparatus of the heated air circulating type. 40

Still another object of the present invention is to
provide a heated air circulating system for ensuring
uniform cooking in a cooking apparatus of the heated
air circulating type including a double stage tray.

Yet another object of the present invention is to pro- 45
vide a combined cooking apparatus of a microwave
oven and a cooking apparatus of the heated air circulat-
ing type.

Other objects and further scope of applicability of the
present invention will become apparent from the de- 50
tailed description given hereinafter. It should be under-
stood, however, that the detailed description and spe-
cific examples, while indicating preferred embodiments
of the invention, are given by way of illustration only,
since various changes and modifications within the 55
spirit and scope of the invention will become apparent
to those skilled in the art from this detailed description.

To achieve the above objects, pursuant to an embodi-
ment of the present invention, an intake aperture is
formed at the center of the ceiling wall of the oven 60
cavity. A first blowoff aperture is formed in the ceiling
wall at one edge thereof contacting a right side wall of
the oven cavity. A second blowoff aperture is formed at
the lower section of a left side wall of the oven cavity.
The second blowoff aperture is located at a height 65
slightly above the lower tray of a double stage tray,
thereby effectively supplying the heated air to the food-
stuff mounted on the lower tray.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be better understood from
the detailed description given hereinbelow and the ac-
companying drawings which are given by way of illus-
tration only, and thus are not limitative of the present
invention and wherein:

FIG. 1 is a sectional view of an embodiment of a
cooking apparatus of the heated air circulating type of
the present invention (taken along line I—I of FIG. 2);
and 10

FIG. 2 is a partially sectional view taken along line
II—II of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A cooking apparatus of the present invention in-
cludes a housing 10 and an oven cavity 12. The oven
cavity 12 is surrounded by a ceiling wall 14, a bottom
wall 16, a rear wall 18, a right side wall 20, a left side
wall 22, and an oven door 24 rotatably secured at the
front face of the cooking apparatus.

A control panel 26 is disposed at the right portion of
the front face of the cooking apparatus for introducing
a cooking command into a control circuit disposed at
the back of the control panel 26.

A magnetron 28 is disposed in a clearance 30 pro-
vided between the housing 10 and the right side wall 20
for performing the microwave cooking. The micro-
wave energy generated by the magnetron 28 is supplied
to the oven cavity 12 through a waveguide 32 which is
secured to the ceiling wall 14. A cooling fan 34 and a
fan motor 36 are disposed in the clearance 30 to cool the
magnetron 28 when microwave cooking is being per-
formed. More specifically, the cooling fan 34 functions
to introduce fresh air from the environment through
openings 38 formed in the bottom wall of the housing
10, thereby creating an air flow shown by arrows 40,
which is discharged through openings formed at the
rear wall of the housing 10. When desired, in the micro-
wave cooking operation, the fresh air is introduced into
the oven cavity 12 via a damper 42 as is well known in
the art of the microwave oven.

An enamel coated metal turntable 44 is disposed at a
bottom section of the oven cavity 12. The turntable 44
is removably coupled to a drive coupler 46 which is
geared to a turntable drive motor 48. The turntable
drive motor 48 is disposed in a clearance formed be-
tween the housing 10 and the bottom wall 16 of the
oven cavity 12. Supporting rollers 50 are secured to the
bottom wall 16 for ensuring a smooth rotation of the
enamel coated metal turntable 44.

An upper tray 52 includes a plurality of supporting
legs 54 so that the upper tray 52 is mounted on the
enamel coated metal turntable 44 to rotate in unison
with the rotation of the turntable 44. The upper tray 52
is a metal mesh plate for supporting foodstuff 56
mounted thereon. Additional foodstuff 58 is mounted
on the enamel coated metal turntable 44.

The cooking apparatus of the present invention fur-
ther includes a circulation fan 60 for circulating heated
air which performs the convection cooking operation.
The circulation fan 60 is driven to rotate by a convec-
tion fan motor 62 via a pulley 64 and a drive belt 66
which is extended between the convection fan motor 62
and the pulley 64. An intake aperture 68 comprising a
plurality of openings formed in the center of the ceiling
wall 14 is provided to vent the air from the oven cavity

12 toward the circulation fan 60. A coil shaped sheath heater 70 is disposed to surround the circulation fan 60 in order to heat up the air drawn through the intake aperture 68. A first blowoff aperture, including a plurality of openings, 72 is formed in the ceiling wall 14 near the corner confronting the right side wall 20, and a second blowoff aperture, including a plurality of openings, 74 is formed in the left side wall 22 near the bottom end thereof. The intake aperture 68 and the first and second blowoff apertures 72 and 74 communicate with each other through a circulation duct 76 for effectively creating an air flow of the heated air as shown by arrows 78. The circulation duct 76 is secured to the ceiling wall 14 and the left side wall 22. The above-mentioned circulation fan 60 and sheath heater 70 are disposed in the circulation duct 76. The circulation fan 60 is located above the intake aperture 68 to effectively circulate the air from the oven cavity 12.

An air flow diverting plate 80 is disposed in the circulation duct 76 near the second blowoff aperture 74 to uniformly distribute the heated air flow within the oven cavity 12. An illumination lamp 82 is disposed in a clearance 84 formed between the housing 10 and the left side wall 22 to illuminate the oven cavity 12.

The circulation duct 76 must be located above the ceiling wall 14 and in the clearance 84 formed between the housing 10 and the left side wall 22, because the magnetron 28, the cooling fan 34, the fan motor 36 and the control circuit are disposed in the clearance 30 formed between the housing 10 and the right side wall 20. The magnetron 28, the cooling fan 34, the fan motor 36 and the control circuit must be protected from a high temperature.

As is well known, in the microwave cooking mode, the magnetron 28 generates microwave energy of 2,450 MHz. In the convection cooking mode, the cooking operation is performed by the heated air flow derived from the circulation fan 60 and the sheath heater 70. In the convection cooking mode, it will be clear from FIG. 1 that the foodstuff 56 mounted on the upper tray 52 is cooked by the heated air flow derived mainly from the first blowoff aperture 72, and the foodstuff 58 mounted on the turntable 44 (lower tray) is cooked by the heated air flow derived mainly from the second blowoff aperture 74. Since the foodstuffs 56 and 58 are rotated by the rotation of the turntable 44, a uniform cooking is ensured.

The turntable 44 can be a ceramic turntable instead of the enamel coated metal turntable.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications are intended to be included within the scope of the following claims.

What is claimed is:

1. A combination microwave oven and heated air circulating type oven which ensures uniform heating at different levels within an oven cavity which comprises:

an outer housing;
an oven cavity surrounded by a ceiling wall, a bottom wall and first and second side walls, said oven cavity disposed within said outer housing and defining a clearance therebetween;

upper support means and lower support means disposed in said oven cavity for supporting foodstuff to be cooked in the upper and lower portion of said oven cavity respectively,

a magnetron disposed in said clearance and supplying microwave energy to said oven cavity through said ceiling wall;

an intake aperture formed near the center of the ceiling wall surrounding said oven cavity;

a first blowoff aperture formed in said ceiling wall near the corner confronting the first side wall of said oven cavity;

a second blowoff aperture formed in a lower portion of the second side wall of said oven cavity, said second side wall of said oven cavity, said second side wall defining the opposite side to said first side wall, the arrangement of said first blowoff aperture on one of the side walls being different from the arrangement of said second blowoff aperture on the other side wall;

circulation duct means disposed in said clearance and secured to said ceiling wall and said second side wall of said oven cavity for housing and providing communication between said intake aperture and said first and second blowoff apertures at the outside of said oven cavity, said intake aperture and said first and second blowoff apertures communicating with said circulating duct means;

circulating fan means for creating a forced air flow in said duct means from said intake aperture to said first and second blowoff apertures, said forced air flow being directed into said oven cavity through said first and second blowoff apertures; and

heater means disposed in said duct means for heating up the forced air flow whereby the heated air generated from the first blowoff aperture heats up the upper surface of the foodstuff disposed on the upper support means and the lower surface of the foodstuff disposed on the lower support means and the heated air generated from the second blowoff aperture heats up the lower surface of the foodstuff disposed on the upper support means and the upper surface of the foodstuff disposed on the lower support means.

2. The combination microwave oven and heated air circulating type oven of claim 1, wherein said circulation fan means is disposed in said duct means and located above said intake aperture.

3. The combination microwave oven and heated air circulating type oven of claim 1, wherein the lower support means is

a turntable
and said second blowoff aperture is located at a height slightly higher than the surface of said turntable.

4. The combination microwave oven and heated air circulating type oven of claim 3 wherein the upper support means is

an upper tray containing supporting legs which mount said upper tray on said turntable in such a fashion as to rotate in unison with the rotation of said turntable.

5. The combination microwave oven and heated air circulating type oven of claim 3, wherein said turntable comprises an enamel coated metal turntable removably coupled to a rotation drive source.

6. The combination microwave oven and heated air circulating type oven of claim 1, wherein an air flow diverting plate is operatively associated with the second blowoff aperture to effectively distribute the heated airflow between the upper and lower support means.

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